

COILABLE HDPE CONDUIT OVALITY AND COIL-SET

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Foreword

This technical note was developed and published with the technical help and financial support of the members of the Plastics Pipe Institute (PPI). These members have shown their commitment to developing and improving quality products by assisting standards development organizations in the development of standards, and also by developing design aids and reports to help engineers, code officials, specifying groups, contractors and users.

The purpose of this technical note is to provide general information about the condition of ovality and coil-set in high density polyethylene (HDPE) conduit products, and measures that can be taken by installers to reduce ovality during installation.

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COILABLE HDPE CONDUIT OVALITY AND COIL-SET

1.0 SCOPE

High density polyethylene (HDPE) conduit is the preferred material to house and protect electrical power and telecommunications cables within. It offers unmatched corrosion and chemical resistance, is flexible, durable and available in long reel lengths to reduce joints and installation time. HDPE conduit is available in a variety of sizes, wall types, colors, and lengths.

HDPE conduit's flexibility allows it to be coiled and provided in long lengths, thereby improving installation efficiencies. This technical note provides information about ovality caused by the coiling of HDPE conduit and cable in conduit, and methods for mitigating ovality and coil-set prior to and during installation.

2.0 DEFINITIONS

Bend Radius: the measure of conduit's curvature from a center point to the mid-line of the conduit's diameter.

Bend Angle: the measure of a conduit's change in direction, measured in degrees or radians.

Coil-Set: an inherent tendency for conduit to conform over time to the curved shape or bend radius of the coil or reel on which it has been stored.

Creep: the time dependent viscous flow component of deformation. It refers to the response of PE, over time, to a constant static load. When PE is subjected to a constant static load, it deforms immediately to a strain predicted by the stress-strain modulus determined from the tensile stress-strain curve. At high loads, the material continues to deform at an ever decreasing rate, and if the load is high enough, the material may finally yield or rupture. PE piping materials are designed in accordance with rigid industry standards to assure that, when used in accordance with industry recommended practice, the resultant deformation due to sustained loading, or creep, is too small to be of engineering concern. – [PPI Handbook of PE Pipe, 2nd Edition](#)

Ovality: a measurement that is expressed as a percentage of the variation between the maximum Outside Diameter (OD) minus the minimum OD, divided by the average OD.

Ovality percentage is calculated using the following formula:

$$\% \text{ Ovality} = \frac{(\text{Maximum OD} - \text{Minimum OD})}{(\text{Maximum OD} + \text{Minimum OD})} \times 200$$

Ovality is specified in product standards and is measured at the time of manufacture in accordance with industry standards.

Pipe Stiffness (PS): the value obtained by dividing the force per unit length of specimen by the resulting deflection in the same units at the prescribed percentage deflection.ⁱ

Wall Thickness: the actual thickness of the conduit wall, measured as half of the difference between the outside diameter and the inside diameter at any point along the conduit wall. HDPE conduit is available in several diameter types (e.g. IPS, SIDR, True-size, and Schedule) and several wall types (e.g. SDR, SIDR, and Schedule). Definitions of each of those wall types are published in *ASTM F412 Standard Terminology Related to Plastic Piping Systems* and copied below with permission of ASTM International.

Standard dimension ratios (SDR): a specific ratio of the average specified outside diameter to the minimum specified wall thickness (D_o/t) for outside diameter-controlled plastic pipe, the value of which is derived by adding one to the pertinent number selected from the ANSI Preferred Number Series 10.ⁱⁱ

Standard inside diameter dimension ratio (SIDR): a specific ratio of the average specified inside diameter to the minimum specified wall thickness (D_i/t) for inside diameter controlled plastic pipe, the value of which is derived by subtracting one from the pertinent number selected from the ANSI Preferred Number Series 10.ⁱⁱ

Schedule: a pipe size system (outside diameters and wall thicknesses) originated by the iron pipe industry.

See industry standards such as ASTM F2160ⁱⁱⁱ, NEMA TC 7^{iv}, CSA C22.2 No.327^v, or UL 651A^{vi} for actual conduit dimensions, and ASTM D3485^{vii} or UL 1990^{viii} for cable in conduit dimensions.

Stress relaxation: another unique property arising from the viscoelastic nature of PE. When subjected to a constant strain (deformation of a specific degree) that is maintained over time, the load or stress generated by the deformation slowly decreases over time, but it never relaxes completely. This stress relaxation response to loading is of considerable importance to the design of PE piping systems. It is a response that decreases the stress in pipe sections which are subject to constant strain. – [*PPI Handbook of PE Pipe, 2nd Edition*](#)

Trade size: nominal diameter

Trenchless Installations: Methods of installing conduit that does not require digging a trench for installation of the conduit. Trenchless methods include:

2.1. Horizontal Directional Drilling (commonly referred to as HDD)

A technique for installing pipes, such as conduit, below ground using a surface-mounted drill rig that launches and places a drill string at a shallow angle to the surface and has tracking and steering capabilities.